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## Tobacco pack display at hospitality venues after the introduction of standardised tobacco packaging

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2018-027868
Article Type:	Research
Date Submitted by the Author:	11-Nov-2018
Complete List of Authors:	Nee-Nee, Johanna; University of Otago Sutherland, Kirsty; University of Otago Holland, Rebecca; University of Otago Wilson, Miriam; University of Otago Ackland, Samuel; University of Otago Bocock, Claudia; University of Otago Cartmell, Abbie; University of Otago Earp, Jack; University of Otago Grove, Christina; University of Otago Hewson, Charlotte; University of Otago Jefferies, Will; University of Otago Keefe, Lucy; University of Otago Lockyer, Jamie; University of Otago Patel, Saloni; University of Otago Quintans, Miguel; University of Otago Robbie, Michael; University of Otago Teape, Lauren; University of Otago Yang, Jess; University of Otago Wilson, Nick; University of Otago, Public Health Hoek, Janet; University of Otago Thomson, George; University of Otago,
Keywords:	smoking, pack display, standardised tobacco packaging, field observation

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**Title page**

**Tobacco pack display at hospitality venues after the introduction of standardised tobacco packaging**

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**WORD COUNT: 2756** (excluding title page, abstract, references, tables)

## ABSTRACT

### Objectives

In March 2018, New Zealand introduced standardised tobacco packaging that also featured new pictorial warnings, with implementation completed by early June 2018. We evaluated how the new packaging affected tobacco packaging display and smoking behaviours.

**Design:** Before-and-after descriptive field observation study.

**Setting:** Central city area of the capital city of New Zealand (Wellington).

**Participants:** Observations of people smoking and tobacco packs were made at 56 hospitality venues with outdoor tables (2422 separate venue observations), after the introduction of standardised tobacco packaging. Comparisons were made with a prior study in the same setting, from a time when tobacco packaging was still highly branded.

### Results

A total of 8191 patrons, 1113 active smokers and 889 packs were observed over 2422 venue observations. There were 0.8 visible packs per active smoker in 2018, compared to 1.26 in 2014 (risk ratio [RR] = 0.64, 95%CI: 0.60 to 0.67,  $p < 0.0001$ ). The new packs in 2018 were also less likely to be displayed face up, compared to packs in 2014 which had brand imagery on the front face (RR = 0.77, 95%CI: 0.72 to 0.83,  $p < 0.0001$ ). Pack display (2014 to 2018 RR = 3.09 and 3.1 respectively) and active smoking were higher at venues without children present, compared to at venues with children present (and that this was consistent over time).

### Conclusions

The significant reduction in the number of visible packs per active smoker, along with the reduction in face up positioning of packs, suggests that smokers found the new standardised packs more aversive. Countries introducing standardised packaging should consider these type of evaluation activities.

### ARTICLE SUMMARY: Strengths and limitations of this study

- This appears to be the first study outside Australia to report on objective changes to pack display and smoking behaviours after the introduction of standardised tobacco packaging.
- Observations were uniquely carried out during the end of the phase-in period for new packs, when the likely novel effect of the standardised packaging on pack display might potentially be greatest.
- This study was comparable to a 2014 study conducted in the same area prior to the implementation of standardised packaging, when such packaging was still highly branded.
- However, the study was only in one city and did not collect data in contrasting areas of socio-economic status.
- The four year period 2014-18 was not directly comparable to the Australian before and after study periods, was not in the same month in 2014 and 2018 (along with different weather conditions), and our study only covered one post-implementation time period.

**Keywords:** smoking, pack display, standardised tobacco packaging, field observation

INTRODUCTION

Tobacco marketing continues to foster smoking uptake among young people, even in countries with progressive policy environments. There is strong evidence that exposure to tobacco marketing promotes smoking experimentation among non-smokers, reinforces regular smoking, and predisposes relapse.[1 2] Governments have responded by restricting advertising and promotion, and introducing purchase age restrictions. However, tobacco marketing has continued through various media, including the brand imagery shown on tobacco packets.[3-5]

Brand imagery on tobacco products creates alluring connotations that increase the appeal of tobacco brands to youth and young adults, and reduce the effectiveness of health warnings on tobacco packages.[2 6] In response to this evidence, countries such as Australia, France, Hungary, Ireland, New Zealand (NZ), Norway, and the United Kingdom (UK) have introduced standardised tobacco packaging (often referred to as “plain packaging” albeit typically including large pictorial health warnings). This policy limits residual tobacco marketing and reduces the appeal of tobacco products, while increasing the salience and impact of pictorial health warnings, and reducing misperceptions about the harms caused by tobacco use.[4 5] The policy is endorsed by the World Health Organization (WHO) as an effective tool in smoking prevention.[7] Research from Australia suggests that standardised packaging has reduced smoking prevalence, including among indigenous populations and people experiencing relatively greater deprivation.[8]

The Australian regulations changed the warning size from 30% of the front of the pack and 90% of the back of the pack, to 75% of the front and 90% of the back. Evidence from Australia showed that, prior to the implementation of standardised tobacco packaging, 11% of patrons outside cafés and bars had a pack displayed; the majority of these were face up, revealing the branding.[9] A post-implementation measure found a 15% reduction in observed packs per patron. Furthermore, there was a 12% reduction in the proportion of packs displayed face up; previously the most prominent pictorial health warnings were on the back of packs.[10] However, later studies in Australia found that rate of packs displayed per active smoker had not significantly decreased immediately or one and two years post-implementation.[11 12]

Similar research was conducted in NZ in March 2014 by Martin *et al*, prior to the implementation of standardised packaging. It was found that 8.9% of café/bar patrons had a visible tobacco pack, there were 1.3 packs visible per active smoker, and that 80% of these packs were orientated face up, with 8% face down.[13] The levels of smoking and of pack visibility per adult patron were higher when there were no children a venues, compared to when at least one child was present (p<0.0001). This NZ study found marked differences in active smoking, pack display and children present across three city areas.

Subsequent to this the NZ Government passed standardised packaging legislation,[14] with the law providing a transition period from 14 March to 6 June 2018, after which all tobacco products sold had to be in standardised packets. The regulations prohibited the use of tobacco company brand imagery and required the packets to have large pictorial images and prominent health warning messages. The required transition was from 30% to 70% of the front of the pack, and from 90% to 100% of the back of the pack. These regulations only permitted the brand name and manufacturer information to appear in the mandated colours and type fonts.[15]

Given this background, we aimed to examine the impact of standardised packaging on pack display in NZ using the benchmarks documented by the previous NZ work. More specifically, we hypothesised that there would be: (i) a decrease in tobacco pack display per active smoker; and (ii) a decrease in the prevalence of face up display of the new tobacco packs.

Between March 2014 and May 2018 in NZ there were four tobacco tax rises (which did not necessarily translate to effective price rises),[16] and very little tobacco control mass media activity.[17] The prevalence of current smoking in adults declined from 17.4% in 2013-14 to 15.7% in 2016-17.[18]

## METHODS

The methods for this study were closely based on the previous NZ study in 2014,[13] in order to allow comparisons of the results.

### Site and venue selection

We observed patrons outside hospitality venues that allowed smoking in central Wellington City (capital city of NZ). Observations were made in the same street areas sampled by in 2014 and included the same three main boulevards: Cuba Street, Courtenay Place and the Waterfront. These areas all have venues with high patronage and outdoor seating arrangements, albeit with variations in the number of children present.

Since 2014, some of the 55 originally studied venues had closed (n=15); others no longer had outdoor seating visible from a public walkway (n=3), or were not suitable for other reasons (n=2). These 20 inappropriate venues were excluded from the repeat study. There were 21 new venues that also met the inclusion criteria of visible outdoor seating, allowing smoking and being in the same areas. This resulted in observations at 56 venues: 19 in Cuba St, 21 in Courtney Place and 16 in the Waterfront.

### Data collection methods

Data collection was conducted during 16 to 27 May 2018 (late autumn in NZ). Data were collected by 17 medical students between 3.30pm and 9pm on weekdays and 12pm and 9pm on weekends (and generally in all weather conditions owing to the limited time available). We recorded the number of patrons, active smokers, child patrons, and cigarette packs, and tobacco pouches displayed. The same definition of 'active smokers' was used as in the 2014 study and in the Australian studies, those holding/rolling/lighting/smoking a cigarette.

Four or five rounds of venue observations were made per day, starting at a minimum of 1.25 hour intervals between rounds, and taking a pre-defined circuit of all 56 venues. Field workers were given the option to work alone or in pairs, though the latter was recommended after 6.15pm, during times predicted to have a higher volume of patrons, so that observers could cross-check their observations. We did not assess inter-observer reliability, as Martin *et al* had already established high inter-observer agreement using this method (as had Australian researchers).[9]

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**Data processing and analysis**

Recorded observations in the field were entered directly into an Excel spreadsheet using Google Forms. Data manipulation and analysis was performed using pivot tables in Excel. Confidence intervals and two-tailed p-values (using the Mantel-Haenszel chi square test) were calculated using Open Source Epidemiologic Statistics for Public Health online ([http://www.openepi.com/Menu/OE\\_Menu.htm](http://www.openepi.com/Menu/OE_Menu.htm)).

**Ethics approval**

Ethical approval for this study (D18/121) was obtained on 16 April 2018 via standard University of Otago processes. The approval was subsequently amended on 17 May to allow for data collection to occur beyond daylight hours.

**RESULTS**

**Observed conditions, populations, venues and smoking**

There was rain on five of the 10 observation days, compared to zero days in 2014. The average daytime temperature was 14°C (4°C cooler than in March 2014) and the average wind speed was 18kmph (9kmph faster than in March 2014). For a similar number of venue observations in 2014 and 2018, in 2018 a total of 7977 adult patrons and 214 child patrons were observed (Table 1), less than half the patrons in 2014. Children comprised 2.6% of all observed patrons (compared to 3% in 2014). Of all patrons, 13.6% (n=1113) were observed actively smoking (cigarettes in their hands or mouths), 6.5 percentage points (absolute value) higher than in 2014 (Table 2). Consistent with the pattern of findings in the 2014 study, the prevalence of active smoking was highest on Courtenay Place (18.2%), followed by Cuba Street (13.9%) and the Waterfront area (9.4%).

**Table 1. Descriptive statistics for observed tobacco packs, smokers, patrons and children at hospitality venues with outdoor tables for the three study areas in central Wellington City in May 2018, compared with March 2014**

Characteristic	Study areas								Difference in totals between studies (%)
	Courtenay Place		Cuba Street		Waterfront		Total		2018 compared to 2014
	2014	2018	2014	2018	2014	2018	2014	2018	
Number of venues	22	21	21	19	12	16	55	56	+1.8
Average observations per venue	47	43	59	45	59	42	54	43	-20.4
Total venue observations	1024	901	1239	847	708	674	2971	2422	-18.5
Packs observed	636	381	597	321	474	187	1707	889	-47.9
Active smokers	508	435	504	416	345	262	1357	1113	-18.0
Adult patrons	3893	2384	4359	2970	10,476	2623	18,728	7977	-57.4
Child patrons (within 10m of the venue)	26	8	38	29	397	177	461	214	-53.6



**Table 2. Active smoking and visible tobacco packs at hospitality venues by area and day of the week in central Wellington City in May 2018, compared to March 2014 \***

Area/time	N		People smoking/all patrons % (95% CI)		Difference %	N		Packs visible/all patrons % (95% CI)		Difference %	Packs visible/active smoker (absolute)		Difference (absolute)
	2014	2018	2014	2018		2014	2018	2014	2018		2014	2018	
<b>Total</b>	1357	1113	7.1	13.6	+6.5	1707	889	8.9	10.9	+2.0	1.26	0.80	-0.46
2018			(6.7 – 7.4)	(12.9 – 14.3)				(8.5 – 9.3)	(10.2 – 11.5)				
n=8191													
2014													
n=19,189													
<b>By area:</b>													
Cuba Street	504	416	11.5	13.9	+2.4	597	321	13.6	10.7	-2.9	1.18	0.77	-0.41
2018			(10.6 – 12.4)	(12.7 – 15.1)				(8.3 – 19.4)	(9.6 – 11.9)				
n=2999													
2014													
n=4397													
Waterfront	345	262	3.2	9.4	+6.2	474	187	4.4	6.7	+2.3	1.37	0.71	-0.66
2018			(2.9 – 3.5)	(8.3 – 10.5)				(2.8 – 6.0)	(5.8 – 7.6)				
n=2800													
2014													
n=10,873													
Courtenay Place	508	435	13.0	18.2	+5.2	636	381	16.2	15.9	-0.3	1.25	0.88	-0.38
2018			(11.9 – 14.0)	(16.7 – 19.8)				(12.0 – 20.7)	(14.5 – 17.4)				
n=2392													
2014													
n=3919													
<b>By day of week (after 5pm):*</b>													
Mon-Wed	414	295	9.2	20.5	+11.3	588	217	13.1	15.1	+2.0	1.42	0.74	-0.68
2018			(8.4 – 10.1)	(18.5 – 22.7)				(10.2 – 16.2)	(13.3 – 17.0)				
n=1437													
2014													
n=4485													

Area/time	N		People smoking/all patrons % (95% CI)		Difference %	N		Packs visible/all patrons % (95% CI)		Difference %	Packs visible/active smoker (absolute)		Difference (absolute)
	2014	2018	2014	2018		2014	2018	2014	2018		2014	2018	
Thurs-Fri 2018 n=2183 2014 n=2390	264	280	11.0 (9.8 – 12.3)	12.8 (11.5 – 14.3)	+1.8	324	228	13.6 (9.9 – 17.4)	10.4 (9.2 – 11.8)	-3.2	1.23	0.81	-0.41
Sat-Sun 2018 n=1304 2014 n=1821	111	157	6.1 (5.1 – 7.3)	12.0 (10.4 – 13.9)	+5.9	151	124	8.3 (5.1 – 11.7)	9.5 (8.0 – 11.2)	+1.2	1.36	0.79	-0.57

\*Observations in 2014 were collected between 5-8pm weekdays and 12-8pm on weekends, with the intention to collect data when patronage was highest. However, observations in 2018 were collected between 3.30-9pm weekdays and 12-9pm on weekends, with the extended hours to compensate for the reduced sample size due to colder weather conditions.

Note 1: Calculations of active smokers and visible packs may be more relevant per adult patron, rather than per patron as children <12 very rarely smoke. However, to facilitate comparability with the Australian study, we used 'per total patrons' in this table (versus 'per adult patrons').

Note 2: Confidence intervals for the 2014 values for people smoking/all patrons % have been recalculated using the same methodology as used in this study to facilitate comparability.

**Tobacco pack display and positioning**

A total of 889 packs were visible on tables, with the level per patron being 2% percentage points higher than in 2014 (10.9% vs 8.9% respectively). However, the mean number of packs visible on tables per *active smoker* was significantly lower in 2018 (0.8 in 2018 compared to 1.26 in 2014, risk ratio [RR] = 0.64, 95%CI: 0.60 to 0.67, p<0.0001). As in 2014, after 5pm, both the percentage of active smokers and the percentage of packs visible per patron were significantly higher in the weekdays and significantly lower in the weekends.

As this study was conducted shortly after the introduction of standardised packaging, there were both standardised and non-standardised packets in circulation (the legal end date for the sale of non-standardised packets was 6 June, two weeks after data collection concluded). A total of 475 standardised packs were observed compared to 47 non-standardised packs (along with 196 pouches and 171 of unknown type or orientation). When comparing new packs in 2018 to old packs in 2014 (Table 3), we found that visible packs in 2018 were significantly less likely to be displayed face up compared to visible packs in 2014 (RR = 0.77, 95%CI: 0.72 to 0.83). Also, a significantly greater proportion of packs observed were of unknown type or orientation (2.5% in 2014 compared to 20.6% in 2018, p<0.0001).

**Table 3. Tobacco pack orientation on the outdoor tables of hospitality venues in central Wellington City, comparing only new standardised packs in May 2018 and old non-standardised packs in March 2014 (i.e., excluding old-style packs but also excluding roll-your-own pouches from the 2018 sample)\***

Pack orientation	2014		2018		Risk ratio (95% CI)	P value
	n	% (95% CI)	n	% (95% CI)		
Face up	1366	83.5 (81.7 – 85.3)	297	64.6 (60.1 – 68.8)	0.77 (0.72 – 0.83)	<0.0001
Face down	141	8.6 (7.3 – 10.1)	85	18.5 (15.2 – 22.3)	2.10 (1.67 – 2.75)	<0.0001
Standing on the side, top or bottom	31	1.9 (1.3 – 2.6)	7	1.5 (0.7 – 3.2)	0.80 (0.36 – 1.81)	0.5952
Partly concealed (e.g. with wallet, phone, but ignoring lighters)	97	5.9 (4.9 – 7.2)	31	6.7 (4.8 – 9.4)	1.14 (0.77 – 1.68)	0.0688
<b>Total</b>	<b>1635</b>	<b>100%</b>	<b>460</b>	<b>100%</b>		

\*We removed the data on the roll-your-own pouches for 2018 from this analysis on the grounds that it was harder to ascertain orientation than for box-shaped packs, whereas in 2014 this is likely to have been much easier (with only a relatively small pictorial health warning on the front at that time).

**Associations when children were present**

In both 2014 and 2018, the levels of active smoking and visible packs were significantly higher in venues where children were not present and this was consistent over time (Table 4). The RR for pack visibility per adult patron at venues without children present, compared to at venues with children present was 3.10 (95%CI: 2.32 to 4.20), similar to 3.09 in 2014 (95%CI: 2.68 to 3.57). The RR for active smoking per adult patron without children present, compared to with children present, was 3.32 (95%CI: 2.53 to 4.35) compared to 3.16 in 2014 (95%CI: 2.68 to 3.71).

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**Table 4. Comparison of tobacco pack visibility and active smoking at hospitality venues with and without children as patrons in central Wellington City in May 2018 compared to March 2014\***

Venue setting	Packs or active smokers (n)		Adult patrons (n)		Ratio* (%) (95% CI)		Risk ratio for without vs with children		P-value (two-tailed)	
	2014	2018	2014	2018	2014	2018	2014	2018	2014	2018
<b>Pack visibility</b>										
No children present (n = 2778 in 2014 n = 2355 in 2018)	1503	845	13,172	6862	11.4 (10.9 – 12.0)	12.3 (11.6 – 13.1)	3.09 (2.68 – 3.57)	3.10 (2.32 – 4.20)	<0.0001	<0.0001
1+ children present (n = 193 in 2014 n = 67 in 2018)	205	44	5556	1115	3.7 (3.2 – 4.2)	3.9 (2.9 – 5.3)	1.00 (ref)	1.00 (ref)		
<b>Active smoking</b>										
No children present (n = 2729 in 2014 n = 2355 in 2018)	1197	1061	13,172	6862	9.1 (8.6 – 9.6)	15.4 (14.6 – 16.3)	3.16 (2.68 – 3.71)	3.32 (2.53 – 4.35)	<0.0001	<0.0001
1+ children present (n = 242 in 2014 n = 67 in 2018)	160	52	5556	1115	2.9 (2.5 – 3.4)	4.7 (3.6 – 6.0)	1.00 (ref)	1.00 (ref)		

\*Ratio of packs to adult patrons or ratio of people actively smoking to adult patrons. "Children present" included children within 10m of the venue.

Note: Confidence intervals for the 2014 values for people smoking/all patrons % have been recalculated using the same methodology as used in this study to facilitate comparability.

DISCUSSION

Main findings

This study found a marked reduction in visible packs per active smoker in 2018, compared to 2014 (0.8 in 2018 and 1.26 in 2014,  $p<0.0001$ ). Our results also indicated a significant reduction in the proportion of packs displayed face up, when compared to the non-standardised packs in 2014. In 2018, the percentage of patrons observed actively smoking was almost double that in 2014, despite a decrease in smoking prevalence over the last decade.[19] As in 2014, venues with children present had a significantly lower prevalence of smokers and visible packs per patron compared to venues without children present, but there was no significant change to the relative ratios after standardised packaging was introduced.

Strengths and limitations

To our knowledge, this is the first study outside Australia to report objective changes to pack display and smoking behaviours after the introduction of standardised tobacco packaging. Observations were uniquely carried out during the end of the phase-in period for new packs, when the likely novel effect of the standardised packaging on pack display might potentially be greatest. Another strength of this study was the comparability to the 2014 study conducted in the same area prior to the implementation of standardised packaging. Furthermore, the use of Google Sheets for data entry improved quality control, as this approach ensured that any possible transcription error or recall bias was minimised.

We found a greater proportion of packs that were difficult to classify (20.6% in 2018 compared to 2.5% in 2014), which may reflect the presence of multiple pack types (non-standardised packs, standardised packs and pouches) and the fact that data collection occurred when there were fewer daylight hours. The potential difficulty in seeing packs and smokers may have therefore led to an underestimation of their prevalence. Such studies should ideally also be done at one and two years post-implementation, with this type of study matching (or adjustment in the analysis) the season, the weather (wind and temperature), time of day, day of the week, tobacco prices, and mass media campaign expenditure (with such steps not being possible for our particular unfunded study that had only one option for the time period of data collection). However, these factors appear unlikely to have affected a key finding of our study around the changes in the way observed packs were positioned. The study was only in one city and also did not collect data in contrasting areas of socio-economic status.

Strengths and limitations in relation to other studies – important differences in results

The reduction in visible packs per active smoker in 2018 compared to 2014 contrasts with Australian studies,[10-12] which found a drop in active smoking and visible packs per *patron*, but no significant change in visible packs per *active smoker*. The reduction in the proportion of packs displayed face aligns with immediate post-implementation Australian data, which showed a 12% reduction in the proportion of packs displayed face up.[10] The *constant* different rate of packs to patrons in venues with children versus in venues without children differs from Australian studies, where Zacher *et al* 2014 found a decline between before and after the intervention.[10] Also Brennan *et al* showed a greater decline in pack display and the prevalence of active smoking in venues with children present during the early, one year, and two years post standardised packaging phases.[12] We have no further explanation for these country differences, other than to speculate that there might be different attitudes to protecting children from seeing smoking and tobacco products.

Some limitations of this study compared to others were that the four year period 2014-18 was not directly comparable to the Australian before and after study periods, was not in the same month in 2014 and 2018 (along with different weather conditions), and our study only covered one post-implementation time period.

### **The meaning of the study**

Our results suggest smokers may have found the new standardised packs more aversive, though as Brennan *et al* noted,[12] increasing tobacco prices may also have reduced pack display, as smokers may attempt to avoid requests to supply others with tobacco. Efforts to conserve tobacco and avoid social supply requests may be even greater in NZ, where incomes are lower than in Australia, making tobacco relatively less affordable. The reduction in the proportion of packs displayed face up, when compared to the non-standardised packs in 2014, is consistent with suggestions that smokers found the new and larger pictorial warnings on the front of the pack more aversive compared to the non-standardised pack design. The increase in observed smoking may have been due to the difference in weather conditions during the observations in this 2018 study (May, late autumn) compared to during observation in the 2014 study (March, early autumn). Non-smoking patrons may have been more likely to sit indoors in poorer weather conditions, which may explain the higher proportion of patrons observed smoking outdoors in 2018. The stable ratios of smoking and pack display with and without children may be attributable to the small number of children observed at venues, or the increased proportion of patrons who were active smokers. Lower observed occurrence of smoking around children (in both the 2014 and 2018 NZ studies) is a favourable finding, as children are vulnerable to the effects of tobacco marketing and smoking normalisation. Similarly children are vulnerable to second hand smoke exposure, which can persist in outdoor areas and present risks to health.[20]

### **Implications for future tobacco control policies**

This study adds to the growing body of evidence that standardised packaging is likely to be an effective tobacco control intervention that countries should consider adopting to reduce tobacco marketing. The changes observed support the idea that the introduction of standardised packaging makes packs more aversive.

### **Unanswered questions and future research**

Internationally, there is a need for other studies to investigate any links between the introduction of standardised packaging and measures such as smoking uptake and prevalence.[4] This type of study should ideally be repeated to determine whether the effects of standardised packaging continue to hold over time, and in areas with more low-income smokers present. Future work could be desirable in low-income areas and those with higher proportions of minority groups such as (in New Zealand) Māori and Pacific peoples (groups that are burdened by higher smoking rates).[19] Such smokers could also be asked their attitudes to sharing their cigarettes with others around them, to determine the role of high tobacco prices in keeping packs out of view. Countries that introduce standardised packaging should consider these types of before-and-after observational studies to better understand the impact on smoking behaviour and pack display. Such observational studies may also inform the optimal design of legislation for smokefree outdoor public areas. These policies, for instance for outside hospitality areas, have been introduced in a number of jurisdictions.[20-22] The expansion of these smokefree areas and the associated denormalisation of smoking are likely to help increase quitting and reduce relapses to smoking.[23 24] The relatively high proportion of patrons smoking outside hospitality areas can give a misleading impression of the normality of smoking.[25]



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**FUNDING:** This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

**COMPETING INTERESTS STATEMENT:** None declared.

**ACKNOWLEDGEMENTS:** We thank Dr Frederieke Sanne Petrović-van der and the other staff of the Otago University Department of Public Health for their assistance with running this research project.

**AUTHOR CONTRIBUTIONS**

Nick Wilson, George Thomson and Janet Hoek conceived, designed and supervised the overall project.

Johanna Nee-Nee, Kirsty Sutherland, Rebecca Holland, Miriam Wilson, Samuel Ackland, Claudia Bocock, Abbey Cartmell, Jack Earp, Christina Grove, Charlotte Hewson, Will Jefferies, Lucy Keefe, Jamie Lockyer, Saloni Patel, Miguel Quintans, Michael Robbie, Lauren Teape and Jess Yang helped design the project structure and process, collected and analysed data, and wrote areas of the text.

Johanna Nee-Nee, Kirsty Sutherland, Rebecca Holland, Miriam Wilson, Janet Hoek, Nick Wilson and George Thomson drafted the article.

**DATA SHARING STATEMENT:** All data is available on request from the corresponding author.

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# BMJ Open

## Tobacco pack display at hospitality venues after the introduction of standardised tobacco packaging in New Zealand: A field observation study

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2018-027868.R1
Article Type:	Original research
Date Submitted by the Author:	25-May-2019
Complete List of Authors:	Nee-Nee, Johanna; University of Otago Sutherland, Kirsty; University of Otago Holland, Rebecca; University of Otago Wilson, Miriam; University of Otago Ackland, Samuel; University of Otago Bocock, Claudia; University of Otago Cartmell, Abbie; University of Otago Earp, Jack; University of Otago Grove, Christina; University of Otago Hewson, Charlotte; University of Otago Jefferies, Will; University of Otago Keefe, Lucy; University of Otago Lockyer, Jamie; University of Otago Patel, Saloni; University of Otago Quintans, Miguel; University of Otago Robbie, Michael; University of Otago Teape, Lauren; University of Otago Yang, Jess; University of Otago Wilson, Nick; University of Otago, Public Health Hoek, Janet; University of Otago Thomson, George; University of Otago,
<b>Primary Subject Heading</b>:	Smoking and tobacco
Secondary Subject Heading:	Public health, Health policy
Keywords:	smoking, pack display, standardised tobacco packaging, field observation

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**Title page**

**Tobacco pack display at hospitality venues after the introduction of standardised tobacco packaging in New Zealand: A field observation study**

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**WORD COUNT: 2756** (excluding title page, abstract, references, tables)

## ABSTRACT

### Objectives

In March 2018, New Zealand introduced standardised tobacco packaging that also featured new pictorial warnings, with implementation completed by early June 2018. We evaluated how the new packaging affected tobacco pack displays in outdoor areas of hospitality venues.

**Design:** Before-and-after descriptive field observation study.

**Setting:** Central city area of the capital city of New Zealand (Wellington).

**Participants:** Observations of people smoking and tobacco packs were made at 56 hospitality venues with outdoor tables (2422 separate venue observations), after the introduction of standardised tobacco packaging. Comparisons were made with a prior study in the same setting, from a time when tobacco packaging still featured brand imagery.

### Results

A total of 8191 patrons, 1113 active smokers and 889 packs and pouches (522 of known orientation) were observed over 2422 venue observations. There were 0.80 visible packs per active smoker in 2018, compared to 1.26 in 2014 (risk ratio [RR] = 0.64, 95%CI: 0.60 to 0.67,  $p < 0.0001$ ). The new packs in 2018 were also less likely to be displayed face-up, compared to packs in 2014, which had brand imagery on the front face (RR = 0.77, 95%CI: 0.72 to 0.83,  $p < 0.0001$ ). Pack and pouch display (RR = 3.09 in 2014 and 3.10 in 2018) and active smoking (RR = 3.16 in 2014 compared to 3.32 in 2018) were higher at venues without children present, compared to venues with children present (this finding was consistent over time).

### Conclusions

The reduction in the number of visible packs per active smoker, along with the reduction in face-up positioning of packs, suggests that smokers found the new standardised packs less attractive. Countries introducing standardised packaging should consider evaluating social display of tobacco packaging.

### ARTICLE SUMMARY: Strengths and limitations of this study

- This appears to be the first study outside Australia to report on objective changes to pack display after the introduction of standardised tobacco packaging.
- In contrast to other studies, observations were carried out during the end of the phase-in period for new packs, when the likely novel effect of the standardised packaging on pack display was potentially greatest.
- This study was comparable to a 2014 study conducted in the same area prior to the implementation of standardised packaging, when tobacco packaging was still highly branded.
- The study was conducted in only one city and did not collect data in contrasting areas of socio-economic status, thus while the findings enable comparisons with the 2014 study, there may be limits with generalisability.
- The four year period 2014-18 was not directly comparable to the Australian before and after study periods; the later data collection in 2018 (May, not March as in 2014) meant



different weather conditions were experienced, and our study only covered one post-implementation time period.

**Keywords:** smoking, pack display, standardised tobacco packaging, field observation

**INTRODUCTION**

Tobacco marketing continues to foster smoking uptake among young people, even in countries with progressive policy environments. There is strong evidence that exposure to tobacco marketing promotes smoking experimentation among non-smokers, reinforces regular smoking, and predisposes relapse.[1 2] Governments have responded by restricting advertising and promotion, and introducing purchase age restrictions. However, tobacco marketing has continued through various media, including the brand imagery shown on tobacco packets.[3-5]

Brand imagery on tobacco products creates alluring connotations that increase the appeal of tobacco brands to youth and young adults, and reduce the effectiveness of health warnings on tobacco packages.[2 6] In response to this evidence, countries such as Australia, France, Hungary, Ireland, New Zealand (NZ), Norway, and the United Kingdom (UK) have introduced standardised tobacco packaging policies that replaced tobacco branding with less attractive colours and at the same time, large pictorial health warnings. These policies limit residual tobacco marketing and reduce the appeal of tobacco products, while increasing the salience and impact of pictorial health warnings, and reducing misperceptions about the harms caused by tobacco use.[4 5] The policy is endorsed by the World Health Organization (WHO) as an effective tool in smoking prevention.[7] Research from Australia suggests that standardised packaging has reduced smoking prevalence, including among indigenous populations and people experiencing relatively greater deprivation.[8] A 2017 Cochrane review concluded ‘The available evidence suggests that standardised packaging may reduce smoking prevalence’ but also noted that ‘[c]onfidence in this finding is limited, due to the nature of the evidence available.’[5]

The Australian regulations changed the warning size from 30% of the front of the pack and 90% of the back of the pack, to 75% of the front and 90% of the back. Evidence from Australia showed that, prior to the implementation of standardised tobacco packaging, 11% of patrons outside cafés and bars had a pack displayed; the majority of these were face-up, revealing the branding.[9] A post-implementation measure found a 15% reduction in observed packs per patron. Furthermore, there was a 12% reduction in the proportion of packs displayed face-up; previously the most prominent pictorial health warnings were on the back of packs.[10] However, later studies in Australia reported that rate of packs displayed per active smoker had not significantly decreased immediately or one and two years post-implementation.[11 12] All three Australian studies reported a greater reduction in smoking and pack display when children were present compared to when they were not.

Similar research was conducted in NZ in March 2014 by Martin *et al.*, prior to the implementation of standardised packaging. This study found that 8.9% of café/bar patrons had a visible tobacco pack, there were 1.3 packs visible per active smoker, and that 80% of these packs were orientated face-up, with 8% face-down.[13] The levels of smoking and pack visibility per adult patron were higher when there were no children at venues, compared to when at least one child was present (p<0.0001). This NZ study found marked differences in active smoking, pack display and children’s presence across three sites within one city.

Subsequent to this study, the NZ Government passed standardised packaging legislation,[14] with the law providing a transition period from 14 March to 6 June 2018, after which date all tobacco products sold had to be in standardised packets. The regulations prohibited the use of tobacco company brand imagery and required the packets to have large pictorial images and prominent health warning messages. The required transition was from 30% to 70% of the front of the pack, and from 90% to 100% of the back of the pack. The NZ regulations permit the brand name and manufacturer information to appear in the mandated colours and type fonts.[15]

Given this background, we aimed to examine the impact of standardised packaging on pack display in NZ using the benchmarks documented by the previous NZ work. More specifically, we hypothesised that there would be: (i) a decrease in tobacco pack display per active smoker; and (ii) a decrease in the prevalence of face-up display of the new tobacco packs. We considered that 'packs per active smoker' was more likely to be a constant unaffected by the weather, but likely to be influenced by smokers' aversion to displaying the new packs.

Pack display per active smoker may indicate smokers' use of packs as a token of status, identity or group membership. Tobacco pack display per active smoker is important because it is likely to indicate smokers' aversion to standardised packs and may provide insights into how this measure has disrupted the social affiliations fostered by tobacco branding. Wakefield et al have brought together much of the evidence linking pack design regulation with reducing tobacco uptake and use.[16]

Between March 2014 and May 2018, NZ had four tobacco tax rises (which did not necessarily translate to effective price rises),[17] and very little tobacco control mass media activity.[18] The prevalence of current smoking in adults declined from 17.4% in 2013-14 to 15.7% in 2016-17.[19]

## METHODS

The methods for this study were closely based on the previous NZ study in 2014,[13] in order to allow comparisons of the results.

### Site and venue selection

We observed patrons outside hospitality venues that allowed smoking in central Wellington City (capital city of NZ). Observations were made of all the eligible venues in the same street areas sampled in 2014 and included the same three main boulevards: Cuba Street, Courtenay Place and the Waterfront. These areas are within a 1.5km area, and are less than 300m apart. All have venues with high patronage and outdoor seating arrangements, albeit with variations in the number of children present.

Since 2014, some of the 55 originally studied venues had closed (n=15); others no longer had outdoor seating visible from a public walkway (n=3), or were not suitable for other reasons (n=2). These 20 inappropriate venues were excluded from the repeat study. There were 21 new venues that also met the inclusion criteria of visible outdoor seating, allowing smoking



and being in the same areas. In total, we conducted observations at 56 venues: 19 in Cuba St, 21 in Courtenay Place and 16 in the Waterfront.

**Data collection methods**

Data collection was conducted during 16 to 27 May 2018 (late autumn in NZ). This was the only period during which the observer team were available for conducting this research. Data were collected by 17 medical students between 3.30pm and 9pm on weekdays and 12pm and 9pm on weekends (and generally in all weather conditions). The slightly longer hours for data collection than in the 2014 study (which were 5-8pm on weekdays and 12-8pm on weekends) enabled maximum data collection within the limited time available. We recorded the number of patrons, active smokers, child patrons, and cigarette packs and tobacco pouches displayed. The same definition of ‘active smokers’ was used as in the 2014 study and in the Australian studies, those holding/rolling/lighting/smoking a cigarette.

Four or five rounds of venue observations were made per day, starting at a minimum of 1.25 hour intervals between rounds, and taking a pre-defined circuit of all 56 venues. Field workers were given the option to work alone or in pairs, though the latter was recommended after 6.15pm, during times predicted to have a higher volume of patrons, so that observers could cross-check their observations. We did not assess inter-observer reliability, as Martin *et al* had already established high inter-observer agreement using this method (as had Australian researchers).[9]

**Data processing and analysis**

Recorded observations in the field were entered directly into an Excel spreadsheet using Google Forms. Data manipulation and analysis was performed using pivot tables in Excel. Risk Ratios were calculated using two by two tables in Open Epi (<https://www.openepi.com/TwoByTwo/TwoByTwo.htm>). For all calculations of confidence intervals and two-tailed p-values (using the Mantel-Haenszel chi square test) we used Open Source Epidemiologic Statistics for Public Health online ([http://www.openepi.com/Menu/OE\\_Menu.htm](http://www.openepi.com/Menu/OE_Menu.htm)).

**Patient and public involvement**

No patients were involved. The study did not collect data with any possible identifying features relating to individuals.

**Ethics approval**

Ethical approval for this study (D18/121) was obtained on 16 April 2018 via standard University of Otago processes. The approval was subsequently amended on 17 May to allow for data collection to occur beyond daylight hours.

**RESULTS**

We have focused here on the two measures included in our hypotheses, tobacco pack display per active smoker, and the prevalence of face-up display of the new tobacco packs. We report active smoking (point prevalence) to provide a symmetrical report to that of the 2014 study, and as a baseline report on outdoor smoking in poor weather conditions, not because of the direct relevance to standardised packaging.

### Observed conditions, populations, venues and smoking

There was rain on five of the 10 observation days, compared to zero days in 2014. The average daytime temperature was 14°C (4°C cooler than in March 2014) and the average wind speed was 18kmph (9kmph faster than in March 2014). For a similar number of venue observations in 2014 and 2018, in 2018 a total of 7977 adult patrons and 214 child patrons were observed (Table 1), less than half the patrons in 2014. Children comprised 2.6% of all observed patrons (compared to 3% in 2014). Of all patrons, 13.6% (n=1113) were observed actively smoking (cigarettes in their hands or mouths), 6.5 percentage points (absolute value) higher than in 2014 (Table 2). Consistent with the pattern of findings in the 2014 study, the point prevalence of active smoking was highest on Courtenay Place (18.2%), followed by Cuba Street (13.9%) and the Waterfront area (9.4%).

**Table 1. Descriptive statistics for observed tobacco packs and pouches, smokers, patrons and children at hospitality venues with outdoor tables for the three study areas in central Wellington City in May 2018, compared with March 2014**

Characteristic	Study areas								Difference in totals between studies (%)
	Courtenay Place		Cuba Street		Waterfront		Total		2018 compared to 2014
	2014	2018	2014	2018	2014	2018	2014	2018	
Number of venues	22	21	21	19	12	16	55	56	+1.8
Average observations per venue	47	43	59	45	59	42	54	43	-20.4
Total venue observations	1024	901	1239	847	708	674	2971	2422	-18.5
Packs and pouches observed	636	381	597	321	474	187	1707	889	-47.9
Active smokers	508	435	504	416	345	262	1357	1113	-18.0
Adult patrons	3893	2384	4359	2970	10,476	2623	18,728	7977	-57.4
Child patrons (within 10m of the venue)	26	8	38	29	397	177	461	214	-53.6

**Table 2. Active smoking (point prevalence) and visible tobacco packs and pouches at hospitality venues by area in central Wellington City in May 2018, compared to March 2014**

Number of patrons/Area	N*		Active smokers/all patrons % (95% CI)		Difference %	N**		Packs and pouches visible/all patrons % (95% CI)		Absolute difference %	Packs visible/active smoker (absolute)		Difference (absolute)
	2014	2018	2014	2018		2014	2018	2014	2018		2014	2018	
<b>Total</b> 2018 n=8191 2014 n=19,189	1357	1113	7.1 (6.7 – 7.4)	13.6 (12.9 – 14.3)	+6.5	1707	889	8.9 (8.5 – 9.3)	10.9 (10.2 – 11.5)	+2.0	1.26	0.80	-0.46
<b>By area:</b>													
Cuba Street 2018 n=2999 2014 n=4397	504	416	11.5 (10.6 – 12.4)	13.9 (12.7 – 15.1)	+2.4	597	321	13.6 (8.3 – 19.4)	10.7 (9.6 – 11.9)	-2.9	1.18	0.77	-0.41
Waterfront 2018 n=2800 2014 n=10,873	345	262	3.2 (2.9 – 3.5)	9.4 (8.3 – 10.5)	+6.2	474	187	4.4 (2.8 – 6.0)	6.7 (5.8 – 7.6)	+2.3	1.37	0.71	-0.66
Courtenay Place 2018 n=2392 2014 n=3919	508	435	13.0 (11.9 – 14.0)	18.2 (16.7 – 19.8)	+5.2	636	381	16.2 (12.0 – 20.7)	15.9 (14.5 – 17.4)	-0.3	1.25	0.88	-0.38

\* Number of active smokers

\*\* Number of visible tobacco packs and pouches

Note 1: Calculations of active smokers and visible packs/pouches may be more relevant per adult patron, rather than per patron as children <12 very rarely smoke. However, to facilitate comparability with the Australian study, we used 'per total patrons' in this table (versus 'per adult patrons').

Note 2: Confidence intervals for the 2014 values for people smoking/all patrons % have been recalculated using the same methodology as used in this study to facilitate comparability.

**Tobacco pack display and positioning**

As this study was conducted shortly after the introduction of standardised packaging, both standardised and non-standardised packs were in circulation (the legal end date for the sale of non-standardised packets was 6 June, two weeks after data collection concluded). A total of 889 packs and pouches (both standardised and non-standardised) were visible on tables, with the level per patron in 2018 being 2% percentage points higher than in 2014 (10.9% vs 8.9% respectively; risk ratio [RR] = 1.22, 95%CI: 1.13 to 1.32, p<0.0001). However, the mean number of packs or pouches visible on tables per *active smoker* was lower in 2018 (0.80 in 2018 compared to 1.26 in 2014, RR = 0.64, 95%CI: 0.60 to 0.67, p<0.0001).

For the measure of pack orientation (face-up or down), a total of 475 standardised cigarette packs (as opposed to tobacco pouches) were observed, compared to 47 non-standardised packs. We removed the 196 pouches observed from this measure, due to the difficulty of accurate observation of their orientation, along with 171 packs of unknown type or orientation. When comparing new (standardised) packs in 2018 to old (non-standardised) packs in 2014 (Table 3), we found that visible packs in 2018 were less likely to be displayed face-up compared to visible packs in 2014 (RR = 0.85, 95%CI: 0.80 to 0.91). Also, a greater proportion of packs observed were of unknown type or orientation (2.5% in 2014 compared to 20.6% in 2018, p<0.0001).

**Table 3. Tobacco pack orientation on the outdoor tables of hospitality venues in central Wellington City, comparing only new standardised packs in May 2018 and old non-standardised packs in March 2014 (i.e., excluding old-style packs but also excluding roll-your-own pouches from the 2018 sample)\***

Pack orientation	2014		2018		Risk ratio (95% CI)	P-value
	N	% (95% CI)	N	% (95% CI)		
Face-up	1366	83.5 (81.7 – 85.3)	339	71.4 (67.2 – 75.3)	0.85 (0.80 – 0.91)	<0.0001
Face-down	141	8.6 (7.3 – 10.1)	89	18.7 (15.4 – 22.4)	2.17 (1.70 – 2.78)	<0.0001
Standing on the side, top or bottom	31	1.9 (1.3 – 2.6)	8	1.7 (0.8 – 3.2)	0.89 (0.41 – 1.92)	0.791
Partly concealed (e.g. with wallet, phone, but ignoring lighters)	97	5.9 (4.9 – 7.2)	39	8.2 (6.0 – 10.9)	1.38 (0.97 – 1.98)	0.082
<b>Total</b>	<b>1635</b>	<b>100%</b>	<b>475</b>	<b>100%</b>		

\*We removed the data on the roll-your-own pouches for 2018 from this analysis as it was harder to ascertain orientation than for box-shaped packs, whereas in 2014 this is likely to have been much easier (with only a relatively small pictorial health warning on the front at that time). The table does not include the data for packs of unknown orientation, or in cases or tins.

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**Associations when children were present**

In both 2014 and 2018, the levels of active smoking (point prevalence) and visible packs and pouches were higher in venues where children were not present; this finding was consistent over time (Table 4). In 2018, the RR for pack visibility per adult patron at venues without children present, compared to at venues with children present was 3.10 (95%CI: 2.32 to 4.20), similar to 3.09 in 2014 (95%CI: 2.68 to 3.57). The RR for active smoking per adult patron without children present, compared to with children present, was 3.32 in 2018 (95%CI: 2.53 to 4.35) compared to 3.16 in 2014 (95%CI: 2.68 to 3.71).

**Table 4. Comparison of tobacco pack/pouch visibility and active smoking (point prevalence) at hospitality venues with and without children as patrons in central Wellington City in May 2018 compared to March 2014\***

Venue setting (n = number of observations)  Pack or pouch visibility	Packs/pouches or active smokers (n)		Adult patrons (n)		Ratio* (%) (95% CI)		Risk ratio for without vs with children		P-value (two-tailed)	
	2014	2018	2014	2018	2014	2018	2014	2018	2014	2018
No children present (n = 2729 in 2014 n= 2355 in 2018)	1503	845	13,172	6862	11.4 (10.9 – 12.0)	12.3 (11.6 – 13.1)	3.09 (2.68 – 3.57)	3.10 (2.32 – 4.20)	<0.0001	<0.0001
1+ children present (n = 242 in 2014 n = 67 in 2018)	205	44	5556	1115	3.7 (3.2 – 4.2)	3.9 (2.9 – 5.3)	1.00 (ref)	1.00 (ref)		
<b>Active smoking</b>										
No children present (n = 2729 in 2014 n= 2355 in 2018)	1197	1061	13,172	6862	9.1 (8.6 – 9.6)	15.4 (14.6 – 16.3)	3.16 (2.68 – 3.71)	3.32 (2.53 – 4.35)	<0.0001	<0.0001
1+ children present (n = 242 in 2014 n = 67 in 2018)	160	52	5556	1115	2.9 (2.5 – 3.4)	4.7 (3.6 – 6.0)	1.00 (ref)	1.00 (ref)		

\*Ratio of packs to adult patrons or ratio of people actively smoking to adult patrons. "Children present" included children within 10m of the venue. 2014 data from Table 5 of Martin et al.

Note: Confidence intervals for the 2014 values for people smoking/all patrons % have been recalculated using the same methodology as used in this study to facilitate comparability.



DISCUSSION

Main findings

This study found a marked reduction in visible packs or pouches per active smoker in 2018, compared to 2014 (0.8 in 2018 and 1.26 in 2014,  $p<0.0001$ ). Our results also indicated a reduction in the proportion of packs displayed face-up, when compared to the non-standardised packs in 2014. In 2018, the percentage of patrons observed actively smoking was almost double that in 2014, despite a decrease in smoking prevalence over the last decade.[20] As in 2014, venues with children present had a lower prevalence of smokers and visible packs per patron compared to venues without children present, but the relative ratios between venues with and without children showed little change after standardised packaging was introduced in 2018. As in 2014, we found marked differences in active smoking and pack display per active smoker between the three close-by areas in the central city.

Strengths and limitations

To our knowledge, this is the first study outside Australia to report objective changes to pack display in outdoor areas of hospitality venues after the introduction of standardised tobacco packaging. In contrast to other studies, observations were carried out during the end of the phase-in period for new packs, when the likely novel effect of the standardised packaging on pack display was potentially greatest. Another strength of this study was the comparability to the 2014 study conducted in the same area prior to the implementation of standardised packaging. Furthermore, the use of Google Sheets for data entry improved quality control, as this approach ensured that any possible transcription error or recall bias was minimised.

However, the data from the end of the transition period may not show the full impact of the changes that would have happened once all old packs had been used, as some consumers may have purchased cartons or have used their packs slowly. The impact in the medium to long-term may also be different, as the novelty declines and wear-out occurs. From our results, the rollout of new packs appeared to be 475/522 (91%) complete. We also found a greater proportion of packs that were difficult to classify (20.6% in 2018 compared to 2.5% in 2014), which may reflect the presence of multiple pack types (non-standardised packs, standardised packs and pouches) and the fact that data collection occurred when there were fewer daylight hours. The potential difficulty in seeing packs and smokers may have therefore led to an underestimation of their prevalence.

It is plausible that packs of ‘unknown type or orientation’ may have been more likely to be classified as ‘face up’ if we had been able to observe these more clearly. Yet we have no reason to assume that this was the case, and suspect that a non-differential bias is most likely. We also note that the approximately 10% of packs and pouches observed that still featured tobacco branding may have affected the accuracy of comparisons between 2014 and 2018 for the measure of tobacco pack and pouch display per patron.

Such studies should ideally also be done at one and two years post-implementation, with this type of study matching (or adjusting in the analysis) the season, the weather (wind and temperature), time of day, day of the week, tobacco prices, and mass media campaign expenditure (with such steps not possible for our unfunded study, for which the timing of the data collection was fixed). However, these factors appear unlikely to have affected a key finding of our study regarding changes in how observed packs were positioned. A further limitation is that the study was only in one city and also did not collect data in contrasting areas of socio-economic status.

### Strengths and limitations in relation to other studies – important differences in results

The reduction in visible packs per active smoker in 2018 compared to 2014 contrasts with Australian studies,[10-12] which found a drop in active smoking and visible packs per *patron*, but no significant change in visible packs per *active smoker*. The reduction in the proportion of packs displayed face-up aligns with immediate post-implementation Australian data, which showed a 12% reduction in the proportion of packs displayed face-up.[10] The *constant* different rate of packs to patrons in venues with children versus in venues without children differs from Australian studies, where Zacher *et al* 2014 found a decline between, before, and after the intervention.[10] Also Brennan *et al* showed a greater decline in pack display and the point prevalence of active smoking in venues with children present during the early, one year, and two years post standardised packaging phases.[12] We have no further explanation for these country differences, other than to speculate that there might attitudes to protecting children from seeing smoking and tobacco products may differ across the two nations.

Some limitations of this study compared to others were that the four year period 2014-18 was not directly comparable to the Australian before and after study periods, was not in the same month in 2014 and 2018 (along with different weather conditions), and our study only covered one post-implementation time period.

### The meaning of the study

Our results suggest smokers may have found the new standardised packs less attractive, though as Brennan *et al* noted,[12] increasing tobacco prices may also have reduced pack display, as smokers may attempt to avoid requests to supply others with tobacco. Efforts to conserve tobacco and avoid social supply requests may be even greater in NZ, where incomes are lower than in Australia, making tobacco relatively less affordable. The reduction in the proportion of packs displayed face-up, when compared to the non-standardised packs in 2014, is consistent with suggestions that smokers found the new and larger pictorial warnings on the front of the pack less attractive compared to the non-standardised pack design.

The increase in observed smoking may have been due to the difference in weather conditions during the observations in this 2018 study (May, late autumn) compared to during observation in the 2014 study (March, early autumn). Non-smoking patrons may have been more likely to sit indoors in poorer weather conditions, which may explain the higher proportion of patrons observed smoking outdoors in 2018.

The stable risk ratios across 2014 and 2018 of smoking and pack display, at venues with and without children, may indicate that the presence or absence of children have an enduring effect. This effect seemed to persist even when the weather during the observation period was worse (in 2018), which may have increased the proportion of patrons who were active smokers (i.e., patrons who did not need to go outside to smoke may have been more likely to remain indoors).

Lower observed occurrence of smoking around children (in both the 2014 and 2018 NZ studies) is a favourable finding, as children are vulnerable to the effects of tobacco marketing and smoking normalisation. Similarly, children are vulnerable to second hand smoke exposure, which may persist in outdoor areas and present risks to health.[21]

### Implications for future tobacco control policies

This study adds to the growing body of evidence that standardised packaging is likely to be an effective tobacco control intervention that countries should consider adopting to reduce tobacco marketing. The changes observed support the idea that the introduction of standardised packaging makes packs less attractive, which in turn reduces the social cachet of displaying tobacco products.

**Unanswered questions and future research**

Internationally, there is a need for other studies to investigate any links between the introduction of standardised packaging and measures such as smoking uptake and prevalence.[4] Such studies should ideally be repeated to determine whether the effects of standardised packaging continue to hold over time, and in areas with more low-income smokers present. Future work could be desirable in low-income areas and those with higher proportions of minority groups such as (in New Zealand) Māori and Pacific peoples (groups burdened by higher smoking rates).[20] Such smokers could also be asked their attitudes to sharing their cigarettes with others around them, to determine the role of high tobacco prices in keeping packs out of view. Differences, such as those found in this study between the three close-by areas in the central city, could be explored in other cities to test their stability. In addition, future work could also examine the attitudes and beliefs underpinning pack display.

Countries that introduce standardised packaging should consider these types of before-and-after observational studies to better understand the impact on smoking behaviour and pack display. Such observational studies may also inform the optimal design of legislation for smokefree outdoor public areas. These policies, for instance for outside hospitality areas, have been introduced in a number of jurisdictions.[21-23] The expansion of these smokefree areas and the associated denormalisation of smoking are likely to help increase quitting and reduce relapses to smoking.[24 25] The relatively high proportion of patrons smoking outside hospitality areas can give a misleading impression of the normality of smoking.[26]

**FUNDING:** This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

**COMPETING INTERESTS STATEMENT:** None declared.

**ACKNOWLEDGEMENTS:** We thank Dr Frederieke Sanne Petrović-van der Deen and the other staff of the Otago University Department of Public Health for their assistance with running this research project.

**AUTHOR CONTRIBUTIONS**

Nick Wilson, George Thomson and Janet Hoek conceived, designed and supervised the overall project.

Johanna Nee-Nee, Kirsty Sutherland, Rebecca Holland, Miriam Wilson, Samuel Ackland, Claudia Bock, Abbey Cartmell, Jack Earp, Christina Grove, Charlotte Hewson, Will Jefferies, Lucy Keefe, Jamie Lockyer, Saloni Patel, Miguel Quintans, Michael Robbie, Lauren Teape and Jess Yang helped design the project structure and process, collected and analysed data, and wrote areas of the text.

Johanna Nee-Nee, Kirsty Sutherland, Rebecca Holland, Miriam Wilson, Janet Hoek, Nick Wilson and George Thomson drafted the article.

**DATA SHARING STATEMENT:** All data is available on request from the corresponding author.

For peer review only

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# BMJ Open

## Tobacco pack display at hospitality venues after the introduction of standardised tobacco packaging in New Zealand: A field observation study

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2018-027868.R2
Article Type:	Original research
Date Submitted by the Author:	12-Aug-2019
Complete List of Authors:	Nee-Nee, Johanna; University of Otago Sutherland, Kirsty; University of Otago Holland, Rebecca; University of Otago Wilson, Miriam; University of Otago Ackland, Samuel; University of Otago Bocock, Claudia; University of Otago Cartmell, Abbie; University of Otago Earp, Jack; University of Otago Grove, Christina; University of Otago Hewson, Charlotte; University of Otago Jefferies, Will; University of Otago Keefe, Lucy; University of Otago Lockyer, Jamie; University of Otago Patel, Saloni; University of Otago Quintans, Miguel; University of Otago Robbie, Michael; University of Otago Teape, Lauren; University of Otago Yang, Jess; University of Otago Wilson, Nick; University of Otago, Public Health Hoek, Janet; University of Otago Thomson, George; University of Otago,
<b>Primary Subject Heading</b>:	Smoking and tobacco
Secondary Subject Heading:	Public health, Health policy
Keywords:	smoking, pack display, standardised tobacco packaging, field observation

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**Title page**

**Tobacco pack display at hospitality venues after the introduction of standardised tobacco packaging in New Zealand: A field observation study**

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**WORD COUNT: 2756** (excluding title page, abstract, references, tables)



## ABSTRACT

### Objectives

In March 2018, New Zealand introduced standardised tobacco packaging that also featured new pictorial warnings, with implementation completed by early June 2018. We evaluated how the new packaging affected tobacco pack displays in outdoor areas of hospitality venues.

**Design:** Before-and-after descriptive field observation study.

**Setting:** Central city area of the capital city of New Zealand (Wellington).

**Participants:** Observations of people smoking and tobacco packs were made at 56 hospitality venues with outdoor tables (2422 separate venue observations), after the introduction of standardised tobacco packaging. Comparisons were made with a prior study in the same setting, from a time when tobacco packaging still featured brand imagery.

### Results

A total of 8191 patrons, 1113 active smokers and 889 packs and pouches (522 of known orientation) were observed over 2422 venue observations. There were 0.80 visible packs per active smoker in 2018, compared to 1.26 in 2014 (risk ratio [RR] = 0.64, 95%CI: 0.60 to 0.67,  $p < 0.0001$ ). The new packs in 2018 were also less likely to be displayed face-up, compared to packs in 2014, which had brand imagery on the front face (RR = 0.77, 95%CI: 0.72 to 0.83,  $p < 0.0001$ ). Pack and pouch display (RR = 3.09 in 2014 and 3.10 in 2018) and active smoking (RR = 3.16 in 2014 compared to 3.32 in 2018) were higher at venues without children present, compared to venues with children present (this finding was consistent over time).

### Conclusions

The reduction in the number of visible packs per active smoker, along with the reduction in face-up positioning of packs, suggests that smokers found the new standardised packs less attractive. Countries introducing standardised packaging should consider evaluating social display of tobacco packaging.

### ARTICLE SUMMARY: Strengths and limitations of this study

- This appears to be the first study outside Australia to report on objective changes to pack display after the introduction of standardised tobacco packaging.
- In contrast to other studies, observations were carried out during the end of the phase-in period for new packs, when the likely novel effect of the standardised packaging on pack display was potentially greatest.
- This study was comparable to a 2014 study conducted in the same area prior to the implementation of standardised packaging, when tobacco packaging was still highly branded.
- The study was conducted in only one city and did not collect data in contrasting areas of socio-economic status, thus while the findings enable comparisons with the 2014 study, there may be limits with generalisability.
- The four year period 2014-18 was not directly comparable to the Australian before and after study periods; the later data collection in 2018 (May, not March as in 2014) meant

different weather conditions were experienced, and our study only covered one post-implementation time period.

**Keywords:** smoking, pack display, standardised tobacco packaging, field observation

**INTRODUCTION**

Tobacco marketing continues to foster smoking uptake among young people, even in countries with progressive policy environments. There is strong evidence that exposure to tobacco marketing promotes smoking experimentation among non-smokers, reinforces regular smoking, and predisposes relapse.[1 2] Governments have responded by restricting advertising and promotion, and introducing purchase age restrictions. However, tobacco marketing has continued through various media, including the brand imagery shown on tobacco packets.[3-5]

Brand imagery on tobacco products creates alluring connotations that increase the appeal of tobacco brands to youth and young adults, and reduce the effectiveness of health warnings on tobacco packages.[2 6] In response to this evidence, countries such as Australia, France, Hungary, Ireland, New Zealand (NZ), Norway, and the United Kingdom (UK) have introduced standardised tobacco packaging policies that replaced tobacco branding with less attractive colours and at the same time, large pictorial health warnings. These policies limit residual tobacco marketing and reduce the appeal of tobacco products, while increasing the salience and impact of pictorial health warnings, and reducing misperceptions about the harms caused by tobacco use.[4 5] The policy is endorsed by the World Health Organization (WHO) as an effective tool in smoking prevention.[7] Research from Australia suggests that standardised packaging has reduced smoking prevalence, including among indigenous populations and people experiencing relatively greater deprivation.[8] A 2017 Cochrane review concluded ‘The available evidence suggests that standardised packaging may reduce smoking prevalence’ but also noted that ‘[c]onfidence in this finding is limited, due to the nature of the evidence available.’[5]

The Australian regulations changed the warning size from 30% of the front of the pack and 90% of the back of the pack, to 75% of the front and 90% of the back. Evidence from Australia showed that, prior to the implementation of standardised tobacco packaging, 11% of patrons outside cafés and bars had a pack displayed; the majority of these were face-up, revealing the branding.[9] A post-implementation measure found a 15% reduction in observed packs per patron. Furthermore, there was a 12% reduction in the proportion of packs displayed face-up; previously the most prominent pictorial health warnings were on the back of packs.[10] However, later studies in Australia reported that rate of packs displayed per active smoker had not significantly decreased immediately or one and two years post-implementation.[11 12] All three Australian studies reported a greater reduction in smoking and pack display when children were present compared to when they were not.

Similar research was conducted in NZ in March 2014 by Martin *et al.*, prior to the implementation of standardised packaging. This study found that 8.9% of café/bar patrons had a visible tobacco pack, there were 1.3 packs visible per active smoker, and that 80% of these packs were orientated face-up, with 8% face-down.[13] The levels of smoking and pack visibility per adult patron were higher when there were no children at venues, compared to when at least one child was present (p<0.0001). This NZ study found marked differences in active smoking, pack display and children’s presence across three sites within one city.

Subsequent to this study, the NZ Government passed standardised packaging legislation,[14] with the law providing a transition period from 14 March to 6 June 2018, after which date all tobacco products sold had to be in standardised packets. The regulations prohibited the use of tobacco company brand imagery and required the packets to have large pictorial images and prominent health warning messages. The required transition was from 30% to 70% of the front of the pack, and from 90% to 100% of the back of the pack. The NZ regulations permit the brand name and manufacturer information to appear in the mandated colours and type fonts.[15]

Given this background, we aimed to examine the impact of standardised packaging on pack display in NZ using the benchmarks documented by the previous NZ work. More specifically, we hypothesised that there would be: (i) a decrease in tobacco pack display per active smoker; and (ii) a decrease in the prevalence of face-up display of the new tobacco packs. We considered that 'packs per active smoker' was more likely to be a constant unaffected by the weather, but likely to be influenced by smokers' aversion to displaying the new packs.

Pack display per active smoker may indicate smokers' use of packs as a token of status, identity or group membership. Tobacco pack display per active smoker is important because it is likely to indicate smokers' aversion to standardised packs and may provide insights into how this measure has disrupted the social affiliations fostered by tobacco branding. Wakefield et al have brought together much of the evidence linking pack design regulation with reducing tobacco uptake and use.[16]

Between March 2014 and May 2018, NZ had four tobacco tax rises (which did not necessarily translate to effective price rises),[17] and very little tobacco control mass media activity.[18] The prevalence of current smoking in adults declined from 17.4% in 2013-14 to 15.7% in 2016-17.[19]

## METHODS

The methods for this study were closely based on the previous NZ study in 2014,[13] in order to allow comparisons of the results.

### Site and venue selection

We observed patrons outside hospitality venues that allowed smoking in central Wellington City (capital city of NZ). Observations were made of all the eligible venues in the same street areas sampled in 2014 and included the same three main boulevards: Cuba Street, Courtenay Place and the Waterfront. These areas are within a 1.5km area, and are less than 300m apart. All have venues with high patronage and outdoor seating arrangements, albeit with variations in the number of children present.

Since 2014, some of the 55 originally studied venues had closed (n=15); others no longer had outdoor seating visible from a public walkway (n=3), or were not suitable for other reasons (n=2). These 20 inappropriate venues were excluded from the repeat study. There were 21 new venues that also met the inclusion criteria of visible outdoor seating, allowing smoking

and being in the same areas. In total, we conducted observations at 56 venues: 19 in Cuba St, 21 in Courtenay Place and 16 in the Waterfront.

**Data collection methods**

Data collection was conducted during 16 to 27 May 2018 (late autumn in NZ). This was the only period during which the observer team were available for conducting this research. Data were collected by 17 medical students between 3.30pm and 9pm on weekdays and 12pm and 9pm on weekends (and generally in all weather conditions). The slightly longer hours for data collection than in the 2014 study (which were 5-8pm on weekdays and 12-8pm on weekends) enabled maximum data collection within the limited time available. We recorded the number of patrons, active smokers, child patrons, and cigarette packs and tobacco pouches displayed. The same definition of ‘active smokers’ was used as in the 2014 study and in the Australian studies, those holding/rolling/lighting/smoking a cigarette.

Four or five rounds of venue observations were made per day, starting at a minimum of 1.25 hour intervals between rounds, and taking a pre-defined circuit of all 56 venues. Field workers were given the option to work alone or in pairs, though the latter was recommended after 6.15pm, during times predicted to have a higher volume of patrons, so that observers could cross-check their observations. We did not assess inter-observer reliability, as Martin *et al* had already established high inter-observer agreement using this method (as had Australian researchers).[9]

**Data processing and analysis**

Recorded observations in the field were entered directly into an Excel spreadsheet using Google Forms. Data manipulation and analysis was performed using pivot tables in Excel. Risk Ratios were calculated using two by two tables in Open Epi (<https://www.openepi.com/TwoByTwo/TwoByTwo.htm>). For all calculations of confidence intervals and two-tailed p-values (using the Mantel-Haenszel chi square test) we used Open Source Epidemiologic Statistics for Public Health online ([http://www.openepi.com/Menu/OE\\_Menu.htm](http://www.openepi.com/Menu/OE_Menu.htm)).

**Patient and public involvement**

No patients were involved. The study did not collect data with any possible identifying features relating to individuals.

**Ethics approval**

Ethical approval for this study (D18/121) was obtained on 16 April 2018 via standard University of Otago processes. The approval was subsequently amended on 17 May to allow for data collection to occur beyond daylight hours. No data were gathered that would identify individuals.

**RESULTS**

We have focused here on the two measures included in our hypotheses, tobacco pack display per active smoker, and the prevalence of face-up display of the new tobacco packs. We report active smoking (point prevalence) to provide a symmetrical report to that of the 2014 study,

and as a baseline report on outdoor smoking in poor weather conditions, not because of the direct relevance to standardised packaging.

### **Observed conditions, populations, venues and smoking**

There was rain on five of the 10 observation days, compared to zero days in 2014. The average daytime temperature was 14°C (4°C cooler than in March 2014) and the average wind speed was 18kmph (9kmph faster than in March 2014). For a similar number of venue observations in 2014 and 2018, in 2018 a total of 7977 adult patrons and 214 child patrons were observed (Table 1), less than half the patrons in 2014. Children comprised 2.6% of all observed patrons (compared to 3% in 2014). Of all patrons, 13.6% (n=1113) were observed actively smoking (cigarettes in their hands or mouths), 6.5 percentage points (absolute value) higher than in 2014 (Table 2). Consistent with the pattern of findings in the 2014 study, the point prevalence of active smoking was highest on Courtenay Place (18.2%), followed by Cuba Street (13.9%) and the Waterfront area (9.4%).

**Table 1. Descriptive statistics for observed tobacco packs and pouches, smokers, patrons and children at hospitality venues with outdoor tables for the three study areas in central Wellington City in May 2018, compared with March 2014**

Characteristic	Study areas								Difference in totals between studies (%)
	Courtenay Place		Cuba Street		Waterfront		Total		2018 compared to 2014
	2014	2018	2014	2018	2014	2018	2014	2018	
Number of venues	22	21	21	19	12	16	55	56	+1.8
Average observations per venue	47	43	59	45	59	42	54	43	-20.4
Total venue observations	1024	901	1239	847	708	674	2971	2422	-18.5
Packs and pouches observed	636	381	597	321	474	187	1707	889	-47.9
Active smokers	508	435	504	416	345	262	1357	1113	-18.0
Adult patrons	3893	2384	4359	2970	10,476	2623	18,728	7977	-57.4
Child patrons (within 10m of the venue)	26	8	38	29	397	177	461	214	-53.6

**Table 2. Active smoking (point prevalence) and visible tobacco packs and pouches at hospitality venues by area in central Wellington City in May 2018, compared to March 2014**

Number of patrons/Area	N*		Active smokers/all patrons % (95% CI)		Difference %	N**		Packs and pouches visible/all patrons % (95% CI)		Absolute difference %	Packs visible/active smoker (absolute)		Difference (absolute)
	2014	2018	2014	2018		2014	2018	2014	2018		2014	2018	
<b>Total</b>	1357	1113	7.1	13.6	+6.5	1707	889	8.9	10.9	+2.0	1.26	0.80	-0.46
2018 n=8191			(6.7 – 7.4)	(12.9 – 14.3)				(8.5 – 9.3)	(10.2 – 11.5)				
2014 n=19,189													
<b>By area:</b>													
Cuba Street	504	416	11.5	13.9	+2.4	597	321	13.6	10.7	-2.9	1.18	0.77	-0.41
2018 n=2999			(10.6 – 12.4)	(12.7 – 15.1)				(8.3 – 19.4)	(9.6 – 11.9)				
2014 n=4397													
Waterfront	345	262	3.2	9.4	+6.2	474	187	4.4	6.7	+2.3	1.37	0.71	-0.66
2018 n=2800			(2.9 – 3.5)	(8.3 – 10.5)				(2.8 – 6.0)	(5.8 – 7.6)				
2014 n=10,873													
Courtenay Place	508	435	13.0	18.2	+5.2	636	381	16.2	15.9	-0.3	1.25	0.88	-0.38
2018 n=2392			(11.9 – 14.0)	(16.7 – 19.8)				(12.0 – 20.7)	(14.5 – 17.4)				
2014 n=3919													

\* Number of active smokers

\*\* Number of visible tobacco packs and pouches

Note 1: Calculations of active smokers and visible packs/pouches may be more relevant per adult patron, rather than per patron as children <12 very rarely smoke. However, to facilitate comparability with the Australian study, we used 'per total patrons' in this table (versus 'per adult patrons').

Note 2: Confidence intervals for the 2014 values for people smoking/all patrons % have been recalculated using the same methodology as used in this study to facilitate comparability.



**Tobacco pack display and positioning**

As this study was conducted shortly after the introduction of standardised packaging, both standardised and non-standardised packs were in circulation (the legal end date for the sale of non-standardised packets was 6 June, two weeks after data collection concluded). A total of 889 packs and pouches (both standardised and non-standardised) were visible on tables, with the level per patron in 2018 being 2% percentage points higher than in 2014 (10.9% vs 8.9% respectively; risk ratio [RR] = 1.22, 95%CI: 1.13 to 1.32, p<0.0001). However, the mean number of packs or pouches visible on tables per *active smoker* was lower in 2018 (0.80 in 2018 compared to 1.26 in 2014, RR = 0.64, 95%CI: 0.60 to 0.67, p<0.0001).

For the measure of pack orientation (face-up or down), a total of 475 standardised cigarette packs (as opposed to tobacco pouches) were observed, compared to 47 non-standardised packs. We removed the 196 pouches observed from this measure, due to the difficulty of accurate observation of their orientation, along with 171 packs of unknown type or orientation. When comparing new (standardised) packs in 2018 to old (non-standardised) packs in 2014 (Table 3), we found that visible packs in 2018 were less likely to be displayed face-up compared to visible packs in 2014 (RR = 0.85, 95%CI: 0.80 to 0.91). Also, a greater proportion of packs observed were of unknown type or orientation (2.5% in 2014 compared to 20.6% in 2018, p<0.0001).



**Table 3. Tobacco pack orientation on the outdoor tables of hospitality venues in central Wellington City, comparing only new standardised packs in May 2018 and old non-standardised packs in March 2014 (i.e., excluding old-style packs but also excluding roll-your-own pouches from the 2018 sample)\***

Pack orientation	2014		2018		Risk ratio (95% CI)	P-value
	N	% (95% CI)	N	% (95% CI)		
Face-up	1366	83.5 (81.7 – 85.3)	339	71.4 (67.2 – 75.3)	0.85 (0.80 – 0.91)	<0.0001
Face-down	141	8.6 (7.3 – 10.1)	89	18.7 (15.4 – 22.4)	2.17 (1.70 – 2.78)	<0.0001
Standing on the side, top or bottom	31	1.9 (1.3 – 2.6)	8	1.7 (0.8 – 3.2)	0.89 (0.41 – 1.92)	0.791
Partly concealed (e.g. with wallet, phone, but ignoring lighters)	97	5.9 (4.9 – 7.2)	39	8.2 (6.0 – 10.9)	1.38 (0.97 – 1.98)	0.082
<b>Total</b>	<b>1635</b>	<b>100%</b>	<b>475</b>	<b>100%</b>		

\*We removed the data on the roll-your-own pouches for 2018 from this analysis as it was harder to ascertain orientation than for box-shaped packs, whereas in 2014 this is likely to have been much easier (with only a relatively small pictorial health warning on the front at that time). The table does not include the data for packs of unknown orientation, or in cases or tins.

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**Associations when children were present**

In both 2014 and 2018, the levels of active smoking (point prevalence) and visible packs and pouches were higher in venues where children were not present; this finding was consistent over time (Table 4). In 2018, the RR for pack visibility per adult patron at venues without children present, compared to at venues with children present was 3.10 (95%CI: 2.32 to 4.20), similar to 3.09 in 2014 (95%CI: 2.68 to 3.57). The RR for active smoking per adult patron without children present, compared to with children present, was 3.32 in 2018 (95%CI: 2.53 to 4.35) compared to 3.16 in 2014 (95%CI: 2.68 to 3.71).

**Table 4. Comparison of tobacco pack/pouch visibility and active smoking (point prevalence) at hospitality venues with and without children as patrons in central Wellington City in May 2018 compared to March 2014\***

Venue setting (n = number of observations)	Packs/pouches or active smokers (n)		Adult patrons (n)		Ratio* (%) (95% CI)		Risk ratio for without vs with children		P-value (two-tailed)	
	2014	2018	2014	2018	2014	2018	2014	2018	2014	2018
<b>Pack or pouch visibility</b>										
No children present (n = 2729 in 2014 n= 2355 in 2018)	1503	845	13,172	6862	11.4 (10.9 – 12.0)	12.3 (11.6 – 13.1)	3.09 (2.68 – 3.57)	3.10 (2.32 – 4.20)	<0.0001	<0.0001
1+ children present (n = 242 in 2014 n = 67 in 2018)	205	44	5556	1115	3.7 (3.2 – 4.2)	3.9 (2.9 – 5.3)	1.00 (ref)	1.00 (ref)		
<b>Active smoking</b>										
No children present (n = 2729 in 2014 n= 2355 in 2018)	1197	1061	13,172	6862	9.1 (8.6 – 9.6)	15.4 (14.6 – 16.3)	3.16 (2.68 – 3.71)	3.32 (2.53 – 4.35)	<0.0001	<0.0001
1+ children present (n = 242 in 2014 n = 67 in 2018)	160	52	5556	1115	2.9 (2.5 – 3.4)	4.7 (3.6 – 6.0)	1.00 (ref)	1.00 (ref)		

\*Ratio of packs to adult patrons or ratio of people actively smoking to adult patrons. "Children present" included children within 10m of the venue. 2014 data from Table 5 of Martin et al.

Note: Confidence intervals for the 2014 values for people smoking/all patrons % have been recalculated using the same methodology as used in this study to facilitate comparability.

DISCUSSION

Main findings

This study found a marked reduction in visible packs or pouches per active smoker in 2018, compared to 2014 (0.8 in 2018 and 1.26 in 2014,  $p<0.0001$ ). Our results also indicated a reduction in the proportion of packs displayed face-up, when compared to the non-standardised packs in 2014. In 2018, the percentage of patrons observed actively smoking was almost double that in 2014, despite a decrease in smoking prevalence over the last decade.[20] As in 2014, venues with children present had a lower prevalence of smokers and visible packs per patron compared to venues without children present, but the relative ratios between venues with and without children showed little change after standardised packaging was introduced in 2018. As in 2014, we found marked differences in active smoking and pack display per active smoker between the three close-by areas in the central city.

Strengths and limitations

To our knowledge, this is the first study outside Australia to report objective changes to pack display in outdoor areas of hospitality venues after the introduction of standardised tobacco packaging. In contrast to other studies, observations were carried out during the end of the phase-in period for new packs, when the likely novel effect of the standardised packaging on pack display was potentially greatest. Another strength of this study was the comparability to the 2014 study conducted in the same area prior to the implementation of standardised packaging. Furthermore, the use of Google Sheets for data entry improved quality control, as this approach ensured that any possible transcription error or recall bias was minimised.

However, the data from the end of the transition period may not show the full impact of the changes that would have happened once all old packs had been used, as some consumers may have purchased cartons or have used their packs slowly. The impact in the medium to long-term may also be different, as the novelty declines and wear-out occurs. From our results, the rollout of new packs appeared to be 475/522 (91%) complete. We also found a greater proportion of packs that were difficult to classify (20.6% in 2018 compared to 2.5% in 2014), which may reflect the presence of multiple pack types (non-standardised packs, standardised packs and pouches) and the fact that data collection occurred when there were fewer daylight hours. The potential difficulty in seeing packs and smokers may have therefore led to an underestimation of their prevalence.

It is plausible that packs of ‘unknown type or orientation’ may have been more likely to be classified as ‘face up’ if we had been able to observe these more clearly. Yet we have no reason to assume that this was the case, and suspect that a non-differential bias is most likely. We also note that the approximately 10% of packs and pouches observed that still featured tobacco branding may have affected the accuracy of comparisons between 2014 and 2018 for the measure of tobacco pack and pouch display per patron.

Such studies should ideally also be done at one and two years post-implementation, with this type of study matching (or adjusting in the analysis) the season, the weather (wind and temperature), time of day, day of the week, tobacco prices, and mass media campaign expenditure (with such steps not possible for our unfunded study, for which the timing of the data collection was fixed). However, these factors appear unlikely to have affected a key finding of our study regarding changes in how observed packs were positioned. A further limitation is that the study was only in one city and also did not collect data in contrasting areas of socio-economic status.

### Strengths and limitations in relation to other studies – important differences in results

The reduction in visible packs per active smoker in 2018 compared to 2014 contrasts with Australian studies,[10-12] which found a drop in active smoking and visible packs per *patron*, but no significant change in visible packs per *active smoker*. The reduction in the proportion of packs displayed face-up aligns with immediate post-implementation Australian data, which showed a 12% reduction in the proportion of packs displayed face-up.[10] The *constant* different rate of packs to patrons in venues with children versus in venues without children differs from Australian studies, where Zacher *et al* 2014 found a decline between, before, and after the intervention.[10] Also Brennan *et al* showed a greater decline in pack display and the point prevalence of active smoking in venues with children present during the early, one year, and two years post standardised packaging phases.[12] We have no further explanation for these country differences, other than to speculate that there might attitudes to protecting children from seeing smoking and tobacco products may differ across the two nations.

Some limitations of this study compared to others were that the four year period 2014-18 was not directly comparable to the Australian before and after study periods, was not in the same month in 2014 and 2018 (along with different weather conditions), and our study only covered one post-implementation time period.

### The meaning of the study

Our results suggest smokers may have found the new standardised packs less attractive, though as Brennan *et al* noted,[12] increasing tobacco prices may also have reduced pack display, as smokers may attempt to avoid requests to supply others with tobacco. Efforts to conserve tobacco and avoid social supply requests may be even greater in NZ, where incomes are lower than in Australia, making tobacco relatively less affordable. The reduction in the proportion of packs displayed face-up, when compared to the non-standardised packs in 2014, is consistent with suggestions that smokers found the new and larger pictorial warnings on the front of the pack less attractive compared to the non-standardised pack design.

The increase in observed smoking among these outdoor patrons may have been due to the colder, wetter and windier weather conditions during the observations in this 2018 study (May, late autumn) compared to during observation in the 2014 study (March, early autumn). That is non-smoking patrons may have been disproportionately more likely to sit indoors in these poorer weather conditions in 2018. The other explanation that may be plausible (in the context of on-going declines in smoking prevalence nationally [20]) is the increase in tourism to New Zealand, with tourists having potentially higher smoking rates. But we consider that the weather effects would be more important than any such tourism effects.

The stable risk ratios across 2014 and 2018 of smoking and pack display, at venues with and without children, may indicate that the presence or absence of children have an enduring effect. This effect seemed to persist even when the weather during the observation period was worse (in 2018), which may have increased the proportion of patrons who were active smokers (i.e., patrons who did not need to go outside to smoke may have been more likely to remain indoors).

Lower observed occurrence of smoking around children (in both the 2014 and 2018 NZ studies) is a favourable finding, as children are vulnerable to the effects of tobacco marketing

and smoking normalisation. Similarly, children are vulnerable to second hand smoke exposure, which may persist in outdoor areas and present risks to health.[21]

**Implications for future tobacco control policies**

This study adds to the growing body of evidence that standardised packaging is likely to be an effective tobacco control intervention that countries should consider adopting to reduce tobacco marketing. The changes observed support the idea that the introduction of standardised packaging makes packs less attractive, which in turn reduces the social cachet of displaying tobacco products.

**Unanswered questions and future research**

Internationally, there is a need for other studies to investigate any links between the introduction of standardised packaging and measures such as smoking uptake and prevalence.[4] Such studies should ideally be repeated to determine whether the effects of standardised packaging continue to hold over time, and in areas with more low-income smokers present. Future work could be desirable in low-income areas and those with higher proportions of minority groups such as (in New Zealand) Māori and Pacific peoples (groups burdened by higher smoking rates).[20] Such smokers could also be asked their attitudes to sharing their cigarettes with others around them, to determine the role of high tobacco prices in keeping packs out of view. Differences, such as those found in this study between the three close-by areas in the central city, could be explored in other cities to test their stability. In addition, future work could also examine the attitudes and beliefs underpinning pack display.

Countries that introduce standardised packaging should consider these types of before-and-after observational studies to better understand the impact on smoking behaviour and pack display. Such observational studies may also inform the optimal design of legislation for smokefree outdoor public areas. These policies, for instance for outside hospitality areas, have been introduced in a number of jurisdictions.[21-23] The expansion of these smokefree areas and the associated denormalisation of smoking are likely to help increase quitting and reduce relapses to smoking.[24 25] The relatively high proportion of patrons smoking outside hospitality areas can give a misleading impression of the normality of smoking.[26]

**FUNDING:** This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

**COMPETING INTERESTS STATEMENT:** None declared.

**ACKNOWLEDGEMENTS:** We thank Dr Frederieke Sanne Petrović-van der Deen and the other staff of the Otago University Department of Public Health for their assistance with running this research project.

**AUTHOR CONTRIBUTIONS**

Nick Wilson, George Thomson and Janet Hoek conceived, designed and supervised the overall project.

Johanna Nee-Nee, Kirsty Sutherland, Rebecca Holland, Miriam Wilson, Samuel Ackland, Claudia Bocock, Abbie Cartmell, Jack Earp, Christina Grove, Charlotte Hewson, Will Jefferies, Lucy Keefe, Jamie Lockyer, Saloni Patel, Miguel Quintans, Michael Robbie,

Lauren Teape and Jess Yang helped design the project structure and process, collected and analysed data, and wrote areas of the text.

Johanna Nee-Nee, Kirsty Sutherland, Rebecca Holland, Miriam Wilson, Janet Hoek, Nick Wilson and George Thomson drafted the article.

**DATA SHARING STATEMENT:** All data is available on request from the corresponding author.

For peer review only



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